Monitoring report form for CDM project activity
(Version 06.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT		
Title of the project activity	Nairobi River Basin Biogas Project	
UNFCCC reference number of the project activity	6549	
Version number of the PDD applicable to this monitoring report	2.4	
Version number of this monitoring report	3	
Completion date of this monitoring report	17/05/2019	
Monitoring period number	3	
Duration of this monitoring period	31/12/2016 – 30/12/2018	
Monitoring report number for this monitoring report	1	
Project participants	Kenya (host): Sustainable Energy Strategies Ltd. (SES) (private entity) Germany: atmosfair gGmbH (private entity)	
Host Party	Kenya	
Sectoral scopes	1 : Energy industries (renewable-/ non-renewable sources)	
Applied methodologies and standardized baselines	Methodology: AMS I.E. (version 04) Switch from Non-Renewable Biomass for Thermal Applications by the User No standardized baseline applied	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0 tCO_{2e}	6,746 tCO_{2e}
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	94,734 tCO_{2e}	

SECTION A. Description of project activity

A.1. General description of project activity

>>

(a) Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks

The small-scale project activity aims to construct up to 10,000 domestic biogas units of mainly $2m^3$ and $3m^3$ gas storage capacities each for individual households of at least 2 zero-grazing cows in Nairobi River Basin. Beneficiaries will be mainly dairy farmers and members of rural dairy Saccos (Saving Credit Cooperatives).

The biogas units are fed with cow dung and produce renewable biogas for cooking and water heating purpose. The digesting process will also generate fertile slurry as a by-product, which can be used as manure for local agriculture (e.g. vegetable farming) and as regular income earning activity. The project activity is saving greenhouse gas emissions by replacing non-renewable biomass (mainly fuel wood and charcoal) with renewable biogas. The project activity will also replace fossil fuels (LPG and Kerosene). However, this will not be taken into account for conservativeness reasons.
Carbon revenues will be the only source of subsidy financing. The applied CDM Methodology is AMS I.E. (version 04).

(b) Brief description of the installed technology and equipment

The technology to be employed is of the type “Deenbandhu model 2000”, which is well known and widely implemented in India, i.e. in registered CDM projects. The model has been developed by the Indian NGO, Action for Food Production (AFPRO) since the 1970s. It is a fixed dome type, which combines durable quality with a lifetime of over fifteen years and cheap construction costs by using locally procured materials. Design of the model may develop over time.

(c) Relevant dates for the project activity (e.g construction, commissioning, continued operation periods, etc.)

Date	Milestone
21/08/2010	Conduction of GS Local Stakeholder Consultation in Kikuyu Hospital/Thogoto, Kiambu District
09/10/2010	Commissioning of first biogas plant in project area
28/06/2012	Registration date under UNFCCC
31/12/2012 – 30/12/2014	First Monitoring Period
01/2016	First Issuance of CERs. Total amount: 2,848
31/12/2014 – 30/12/2016	Second Monitoring Period
22/02/2018	Second Issuance of CERs. Total amount: 5463
31/12/2016 – 30/12/2018	Third Monitoring Period

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period

Total: 6,746 tCO_{2e}

A.2. Location of project activity

>>

(a) Host party(ies)

Republic of Kenya

(b) Region/State/Province

The project region is Nairobi River Basin located in the Central Province. The administrative border of the project activity is Kiambu county.

(c) City/Town/Community

Due to its nature (Domestic biogas), the project activity will be implemented in many locations within the administrative borders of Kiambu county at households willing to participate in the CDM project with at least two cows in their premises.

(d) Physical/ Geographical location

The coordinates of the first commissioned biogas units, located in Thogoto in the close proximity to Kikuyu town, are used to represent the physical location of the project activity:
Latitude: 1° 14' 45'' S
Longitude: 36° 39' 55'' E

The following districts and all settlements within these districts belong to Kiambu county:
Lari, Gatundu North, Gatundu, Thika West, Thika East, Limuru, Githunguri, Ruiru, Kiambu, Kabete

It will be ensured that each biogas unit can be uniquely identified by end user agreements where name and contact details are provided.

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Kenya (host)	Sustainable Energy Strategies Ltd. (Private entity A)	No
Germany	atmosfair gGmbH (Private entity B)	No

A.4. Reference to applied methodologies and standardized baselines

>>

AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user (Version 4.0)
UNFCCC link:
https://cdm.unfccc.int/methodologies/DB/WHTQUFLWCVNB9CIUZC198A712WGQR4

No standardized baseline applied.

A.5. Crediting period type and duration

>>

Fixed crediting period (10 years)
Start date of crediting period: 31/12/2012
End date of crediting period: 30/12/2022

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

>>

a) Description of installed technology(ies), technical processes and equipment

Action for Food Production (AFPRO, http://www.afpro.org), an Indian socio-technical non-governmental organization, designed the Deenbandhu domestic biogas model. AFPRO works for the development of the rural poor through effective natural resource management solutions. AFPRO developed several domestic biogas digester types since the 1970s. In the year 2000, AFPRO improved the fixed dome Deenbandhu model of the Deenbandhu model 2000:

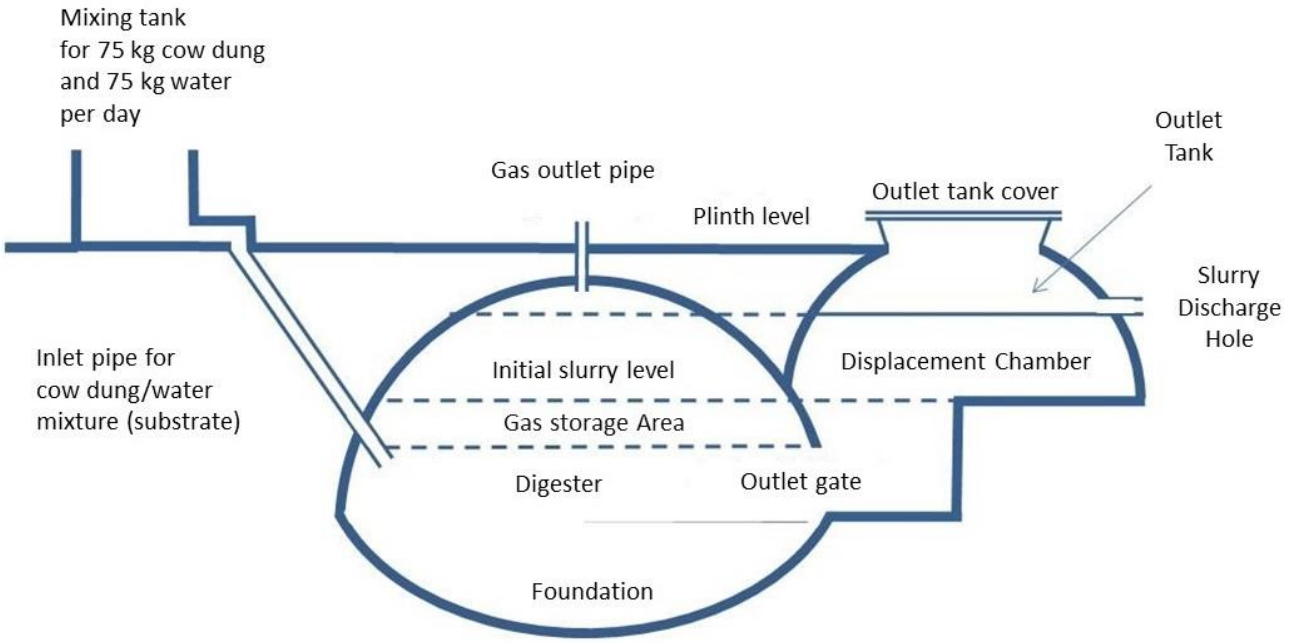

Figure 1: Design sketch of the Deenbandhu model 2000.

Pipes are connecting the biogas units with biogas burners for cooking inside the user's house. Except for the gas burner, all building material for the biogas digester (bricks, cement and sand) are sourced locally. The main components of the Deenbandhu 2000 Biogas model1 are:

Foundation: The foundation of the plant is bowl shaped with a collar around the circumference. The construction of the digester dome is done on this collar.

Dome: The dome of the digester is divided in two parts, digester and gas storage.

Digester: The bottom part is called digester. The mixture of dung and water decomposes in this part and produces gas due to bacterial activity.

Gas storage: The upper part of the digester dome is called gas storage. The gas produced by the bacterial activity is stored in this place.

Gas outlet pipe: A nipple is fitted on the top of the dome, which is connected to a pipe. The gas reaches the kitchen through this pipe. The recovered gas is combusted and used on a biogas burner for cooking in the household.

[1] Indicative description; design of the model may change over time

Inlet:
The pipe through which fresh dung and water enters the plant is called Inlet pipe. This pipe is connected to a small tank for mixing dung and water.

Outlet:
The portion of the plant where the slurry accumulates after coming out of the digester is called outlet tank. It is in two parts. The first bottom part is small and rectangular, which is connected to the dome opening, while the other part of outlet tank is dome shaped. A small slurry discharge hole is provided in the outlet tank.

Plant size (Gas storage)	Dung to be fed into the digester (kg)	Water to be fed into the digester (liter)	Number of cows per household	Number of eaters per household
2 m^3	50	50	Min. 2	5-8
3 m^3	75	75	Min. 3	9-15

b) Information on implementation status of the project activity during monitoring period

The first biogas unit in the project was commissioned on 09 October 2010. According to the sales records and the database of the project, a total of 704 biogas units were constructed, commissioned and in operation at the end of the third monitoring period (30/12/2018) in the project area.

The project is implemented in accordance with the provisions in the PDD. However, it needs to be underlined that the number of commissioned biogas units largely differs from the numbers stated in the PDD due to several reasons such as the relatively high costs for the biogas units. In order to maximize the construction and commissioning of new biogas units, project participants designed new finance mechanisms to support and accelerate the construction of new units.

c) Description of:

(i) The events or situations that occurred during the monitoring period that may impact the applicability of the applied methodology;

No special events which may impact the applicability of the methodology occurred.

(ii) How the issues resulting from these events or situations have been addressed.

Not applicable

d) Request for prior approval

No request for prior approval by the Board of changes to the registered SSC project has been submitted.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

>>
No temporary deviations from registered monitoring plan or applied methodology have occurred during this monitoring period.

B.2.2. Corrections

>>
No corrections to project information or parameters fixed at validation have been submitted or approved during this monitoring period.

B.2.3. Changes to the start date of the crediting period

>>
A revision of the start date of the crediting period was requested by the project participant to the UNFCCC secretariat at the 08/07/2013. The start date of the crediting period was subsequently changed to: 31/12/12.
The projects UNFCCC website is updated accordingly:
https://cdm.unfccc.int/Projects/DB/RWTUV1340886479.47/view

B.2.4. Inclusion of monitoring plan

>>
No further monitoring plan was included to the registered PDD, which was not included at the time of registration.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

>>
No permanent changes to the monitoring plan or applied methodology of the project activity have been approved during this monitoring period or submitted with this monitoring report.

B.2.6. Changes to project design

>>
No changes to the project design of the project activity have been approved during this monitoring period or submitted with this monitoring report.

SECTION C. Description of monitoring system

>>
Data collection procedures and organisational structure

The monitoring consists of three stages:

1. (Continuous) Sales monitoring to determine N_y
2. Sample surveys to determine DO_y
3. Data compilation, quality control and drafting of the Monitoring Report

1. Sales Monitoring

Sales monitoring serves to determine the adjusted total number of biogas units commissioned until period y (N_y). The following diagram illustrates the process of biogas unit commissioning and sales monitoring data flow including the organisational structure:

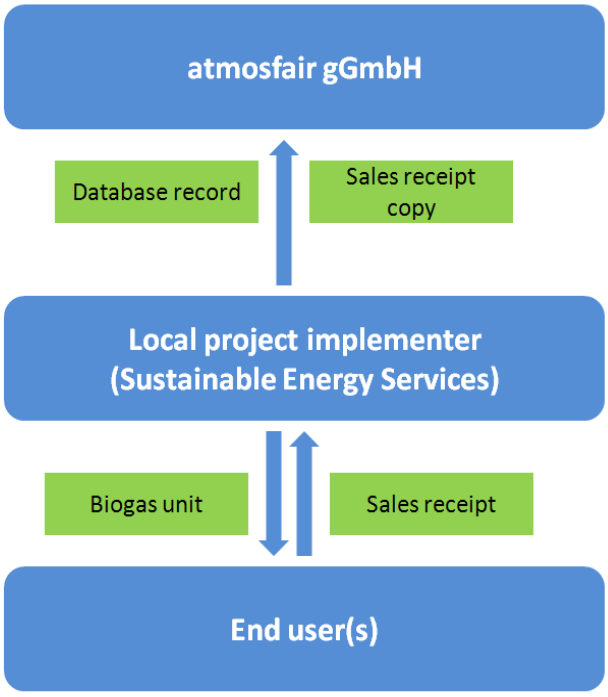

Figure 2: Sales Monitoring Flow Chart.

Data generation:

Every end user acknowledges the purchase and conditions of usage of the biogas unit on a sales receipt. The sales receipt provides information on:

- Type of biogas unit constructed ($2m^3$ or $3m^3$)
- GPS coordinates of biogas unit
- Commissioning date of appliance
- User details (Name, location, telephone number etc.)
- Implementing Entity/ Contact Person
- Paid price and amount of subsidy

Data recording:

The data manager or representative of SES collect the sales receipts from the end users and enter the information from the sales receipts into an electronic database (the “sales records database”).

Data aggregation and reporting:

The data manager of SES submits both, copies of the sales receipt and the electronic datasets from the sales receipts to atmosfair. atmosfair checks for inconsistencies and instructs distributors to take corrective action if necessary.

2. Sample surveys

Sample surveys are conducted that serve to determine the statistically adjusted drop out from total population of appliances in period y (DO_y).

The sample survey data flow including organisational structure is illustrated in the following line diagram:

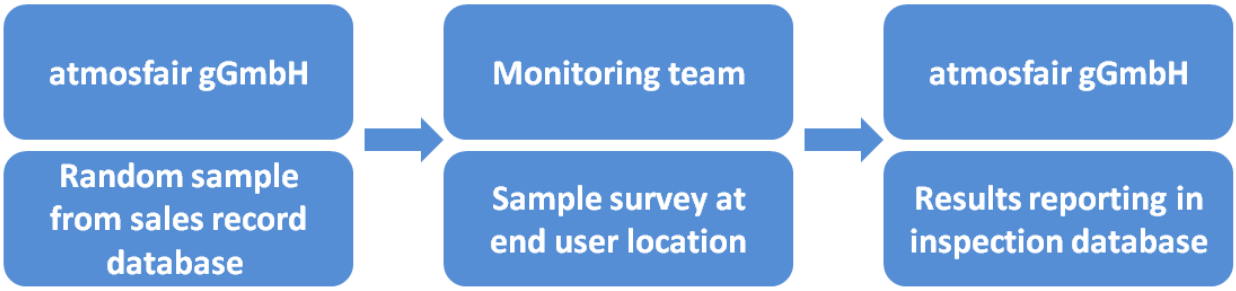

Figure 3: Sample Survey Flow Chart.

Data generation:

atmosfair draws a random sample from the sales records database and submits the electronic sample including user details to the monitoring team. The monitoring team conducts the surveys (user interviews) at the end user locations.

This monitoring period (31/12/2016 – 30/12/2018) covers the years five and six of the ten year crediting period. On 17/01/2019 the random sample was drawn on the basis of all units commissioned until 30/12/2018. The monitoring team conducted the interviews for this between 30/01/2019 and 16/02/2019.

Results from the monitoring are used for the calculation of emission reductions for the third monitoring period (31/12/2016 – 30/12/2018) and are shown separately within the presented monitoring report.

Data recording:

The monitoring team records the information from the user interviews on questionnaires.

Data aggregation and reporting:

The monitoring team submits the questionnaires and the data entry forms to atmosfair. atmosfair checks for inconsistencies and instructs the monitoring team to take corrective actions if necessary. atmosfair aggregates and reports the results in an inspection database.

For the detailed sampling plan, see section D.3.

3. Data compilation, quality control and drafting of the Monitoring Report

atmosfair finally transfers the parameter values from the sales records database and from the inspection database to an Excel spreadsheet containing the equations to calculate the emission reductions of the monitoring period. The achieved values are reported in the monitoring report.

Roles and responsibilities of personnel

Person	Role
Monitoring head	The monitoring head will be responsible for administering the electronic storage, and data review
Monitoring team	The monitoring team will conduct the surveys.

Emergency procedures for the monitoring system

atmosfair has implemented a system of cross-checks to ensure data quality. There is a separation of roles for every step of the data generation, aggregation & recording, calculation and reporting between those who are responsible and those who are controlling the respective step. In particular, the database manager of atmosfair checks correctness and consistency between information on the sales receipts and the corresponding sales database record. In case inconsistencies are detected, the database manager instructs the representative of SES or the database manager to search for the error source. If the error source can be found, the information is corrected accordingly, if not, the database record is removed from the database.

Furthermore, the database manager of atmosfair checks the correctness and consistency of all sampling data collected and processed in this Monitoring Period.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter.)

Data/Parameter	B_y (net per unit)
Unit	tons/year/household
Description	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tons.
Source of data	Kenyan Ministry of Energy & Petroleum: Study On Kenya's Energy Demand, Supply And Policy Strategy For Households, Small Scale Industries And Service Establishments (Final Report, 2002, prepared by Kamfor Ltd.).
Value(s) applied	4.257
Choice of data or measurement methods and procedures	Quantity of fuelwood and charcoal was determined using official, historical data and cross-checked with results from a baseline survey carried out by atmosfair and SES and reviewed by an independent third party. B_y (gross per unit) is multiplied with a net to gross adjustment factor LE_{NRB} of 0.95 to account for leakages as per AMS I.E., v.4: $B_{y\ (net\ per\ unit)} = B_{y\ (gross\ per\ unit)} \bullet LE_{NRB}$
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks.
Additional comments	This is a fixed value throughout the crediting period.

Data/Parameter	$f_{NRB,y}$
Unit	Percent
Description	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods.
Source of data	FAO (Forest Resource Assessment 2010).
Value(s) applied	0.962
Choice of data or measurement methods and procedures	In the NRB assessment using FAO data for each type of forest or non-forest area, most areas do not fulfil the DRB conditions as per the methodology. Areas where the growing stock has increased were counted as renewable sourcing areas.

Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks.
Additional comments	This is a fixed value throughout the crediting period.

Data/Parameter	**$NCV_{biomass}$**
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	AMS I.E., ver. 4
Value(s) applied	0.015
Choice of data or measurement methods and procedures	This is a default value as per AMS I.E., ver. 4, par. 5.
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks.
Additional comments	This is a fixed value throughout the crediting period.

Data/Parameter	**$EF_{projected\_fossil\ fuel}$**
Unit	tCO_2/TJ
Description	Emission factor for substitution of non-renewable woody biomass by similar consumers.
Source of data	AMS I.E., ver. 4 (default value)
Value(s) applied	81.6
Choice of data or measurement methods and procedures	This is a default value as per AMS I.E., ver. 4, par.
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks.
Additional comments	This is a fixed value throughout the crediting period.

D.2. Data and parameters monitored

(Copy this table for each data or parameter.)

Data/Parameter	***N_y***
Unit	Number
Description	Adjusted total number of biogas units deployed until monitoring period y of end users who confirmed that non-renewable biomass is displaced/ substituted.
Measured/calculated/ default	Calculated
Source of data	End user agreements
Value(s) of monitored parameter	672.92
Monitoring equipment	Sales receipts and sales record database
Measuring/reading/recording frequency	Continuous monitoring and recording of N_i

<table>
<tr><td>Calculation method
(if applicable)</td><td>The total number of units commissioned until period y is calculated from the end user agreements where owner and location of the biogas unit are recorded.
$N_y = \sum_{i=1}^{y} n_i \cdot OT_{adjusted,i,y}$
<table><tr><th>Parameter</th><th>Description</th></tr><tr><td>$n_{,i}$</td><td>Number of units commissioned in period i as documented by end user agreements and reported
(Monitoring Period 3: 704)</td></tr><tr><td>$OT_{adjusted,i,y} = \begin{cases} 1 & ,i < y \\ \frac{d_{average,y}}{mp_{length}} & ,i = y \end{cases}$</td><td>Adjustment factor for reduced operational time of appliances deployed in period y</td></tr><tr><td>$d_{average,y}$</td><td>Average number of days that appliances deployed in period y have been operational in period y as determined by respective commissioning dates (from end user agreement) of units counted for $n_{y.}$</td></tr><tr><td>mp_{length}</td><td>Length of monitoring period y</td></tr></table></td></tr>
<tr><td>QA/QC procedures</td><td>Data is collected using the standard procedures as described in an internal Monitoring Manual and is stored for the crediting period and an additional two years.</td></tr>
<tr><td>Purpose of data/parameter</td><td>Baseline emission calculations.</td></tr>
<tr><td>Additional comments</td><td>n/a</td></tr>
</table>

Data/Parameter	***DO$_y$***
Unit	%
Description	Statistically adjusted dropout from total population of units in period y.
Measured/calculated/ default	Calculation from sample survey.
Source of data	Primary data collection: dedicated monitoring team
Value(s) of monitored parameter	0 %
Monitoring equipment	Questionnaire
Measuring/reading/recording frequency	One monitoring campaign has been conducted for this monitoring period.

Calculation method (if applicable)	Monitoring of the statistically adjusted drop out involves two steps: Step 1: Sample survey amongst units deployed as specified in section B.7.2 of this monitoring report. Step 2: Calculation of the adjusted dropout rate at confidence level and precision as required by the methodology (AMS I.E. v.4) for the inspection frequency chosen. The dropouts are determined through spot checks and interviews in which it was examined if the units were operational during the monitoring period, performed by a dedicated monitoring team according to the sampling procedure described in section B.7.2. of the PDD. Substitution of non-renewable biomass has also been checked. Interviews have been reported in a questionnaire. Checks are conducted until the required precision for this parameter is achieved. All questionnaires and information gathered during the sampling by the monitoring team are handed over to the head of the monitoring team that takes care of entering the information to an electronic database. All monitored data as well as questionnaires are finally checked by atmosfair and results are presented in this monitoring report. All formulas applied to determine the statistical precision used are standard formula. Furthermore, according to AMS I.E., v. 4, par.17 the sampling error has to be deducted (*"...the lower bound of a […] confidence interval of the parameter value may be chosen"*) in the event that the required precision could not be achieved because of a small sample size. No deductions have to be made if the precision is achieved by sampling a proper number of units.
QA/QC procedures	Data has been collected using the standard procedures as described in an internal Monitoring Manual and is stored for the crediting period and an additional two years. The households visited during the monitoring confirm by signature that the name and contact details provided in the signed end user agreement are correct and corresponding to the owner of the unit and therefore the biogas units. This check enables to analyse on site whether the owner and contact details stated in the end user agreement of the randomly selected biogas unit do correspond to the visited household and unit.
Purpose of data/parameter	Baseline emission calculations
Additional comments	n/a

D.3. Implementation of sampling plan

>>

a) Description of implemented sampling design

According to AMS I.E. ver. 4, par. 12, '*Monitoring shall consist of checking of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating or are replaced by an equivalent in service appliance.'*

Furthermore, according to par. 14 of the same methodology, monitoring shall ensure that:
'Monitoring should confirm the displacement or substitution of the non-renewable woody biomass at each location. In the case of appliances switching to renewable biomass, the quantity of renewable biomass used shall be monitored.'

For this reason, parameters as stated in Section D.2. of this Monitoring Report are monitored. Due to the high number of units to be deployed an annual check of all units is not economically feasible and therefore a sample is monitored to ensure that all the units deployed are still operating or to

record end of operation and/or replacement of the units in order to determine the statistically adjusted annual or biennial value for dropout (DO_y). Where replacements are made, monitoring shall also ensure that they are replaced by an equivalent in service appliance.

The monitoring team conducted the user interviews between 30/01/2019 and 16/02/2019. This monitoring period all biogas units commissioned until 30/12/2018 are considered. Samples were drawn from the project's database of atmosfair via a computerized random sample. The random sample was drawn on 17/01/2019.

N_y was monitored through sales records for all biogas units commissioned until 30/12/2018. The parameter of DO_y was determined through sample surveys.

The required sample size for DO_y was calculated prior to conducting the sample surveys using the equations for simple random sampling as per EB 67 Annex 6, para 16 to 26. The total number of interviews for this monitoring period was 53.

Precision requirements:
As per applicable methodology AMS-I.E., ver. 4, par. 17: *'When biennial inspection is chosen a 95% confidence interval and a 5% margin of error requirement shall be achieved for the sampling parameter.*

Since project proponents chose to inspect biennial, a 95% confidence interval and a 5% margin of error requirement are applicable for this monitoring period.

a) Collected data, analysis and demonstration on whether the required confidence/precision has been met

Parameter	Calculated sample size	Assumed response rate	Adjusted sample size after considering response rate	Actual number of households sampled to meet the sample size	Confidence	Precision	Achieveed proportion
n (sample size)	50	95%	53	53	95%	0%	100%

Parameter	n*	Value	Standard deviation	Confidence	Precision	Lower bound applicable?
DO_y	53	0%	N/A	95%	0%	No

*valid responses

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

>> Please note that the methodology AMS I.E., ver. 4 does not provide specific equations for calculation of Baseline emissions, project emissions or leakage, only for emission reductions. As Leakage was considered ex-ante, B_y was adjusted to account for the quantified leakage (see also E.3.).

E.2. Calculation of project emissions or actual net removals

>> Not applicable, as methodology AMS I.E., ver. 4 does not consider project emissions.

E.3. Calculation of leakage emissions

>> As per AMS-I.E., ver. 4 par. 10, leakage has to be considered to adjust B_y. In line with the methodology, B_y is therefore multiplied ex-ante by a net to gross adjustment factor LE_{NRB} of 0.95 to account for leakages. Therefore, leakage emissions are considered in the baseline emissions calculation and do not need to be considered during monitoring.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	6,746	Not applicable	Not applicable	0	6,746	6,746

In line with the AMS I. E., ver. 4, emission reductions are calculated using the following equation:

Emission Reductions are calculated as:

$$\boldsymbol{ER_y = B_y * f_{NRB,y} * NCV_{Biomass} * EF_{projected\ fossil\ fuel}}$$

$$\boldsymbol{B_y = N_y * B_y(net\ per\ unit) * (1 - DO_y)}$$

Therefore:

$$\boldsymbol{ER_y = N_y * B_y(net\ per\ unit) * \left(1 - DO_y\right) * f_{NRB,y} * NCV_{Biomass} * EF_{projected\ fossil\ fuel}}$$

Parameter	Unit	Type	Description
ER_y	tCO_2e	Calculated	Emission reduction during the year *y* in tCO_{2e}
N_y	-	Measured	Adjusted total number of biogas units deployed until year y of end users who confirmed that non-renewable biomass was displaced/substituted
DO_y	%	Monitored	Statistically adjusted drop out from total population of units in period y
B_y *(net per unit)*	tons/year/household	Calculated	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tons
$f_{NRB,y}$	%	Fixed	Fraction of non-renewable woody biomass used in the absence of the project activity in year y
$NCV_{biomass}$	TJ/t	Fixed	Net calorific value of the non-renewable woody biomass that is substituted

$EF_{projected\_fossilfuel}$	tCO_2/TJ	Fixed	Emission factor for substitution of non-renewable woody biomass by similar consumers

Notes:
1. AMS I.E., ver. 4 offers two options for determining B_y. Project participants chose option a) of paragraph 6 (a) Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tons/year); this being expressed in the term: $N_y * B_y$ (*net per unit*)

2. Furthermore, AMS I.E., ver.4, para 12 requires checking all or a representative sample of appliances to ensure that they are still operating. This is expressed in parameter DO_y and considered in the calculation of B_y.

3. The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy source (para 10a of AMS I.E., ver.4) is addressed by the net to gross adjustment factor of 0.95. Therefore, B_y *(net per unit)* is calculated according to the following formula:

$$\boldsymbol{B_y(net\ per\ unit) = B_y * LE_{NRB}}$$

Parameter	Unit	Type	Description
B_y *(net per unit)*	Tons/year/household	Fixed	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tons (including potential leakage)
B_y *(gross per unit)*	Tons/year/household	Fixed	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tons
LE_{NRB}	-	Fixed	0.95 default value

Monitoring Period 3 (31/12/2016 – 30/12/2018):

Parameter	Unit	31/12/2016 – 30/12/2018	Sources
B_y (gross per unit)	t/a	4.482	Fixed ex-ante - PDD
LE_{NRB}	-	0.95	Fixed - AMS I.E., ver. 4
B_y (net per unit)	t/a	4.257	Calculated
N_y	-	673	Calculated
DO_y	%	0 %	Monitored
Number of years in MP		2	
B_y	t	5729.28	Calculated, for two years
$f_{NRB,y}$	fraction	0.962	Fixed ex-ante - PDD
$NCV_{biomass}$	TJ/t	0.015	Fixed ex-ante - PDD
$EF_{projected\ fossilfuel}$	t CO_2/TJ	81.6	Fixed ex-ante - PDD
ER_{MP2}	**tCO_2e**	**6,746**	Calculated

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
6,746 t CO_2e	93,734 tCO_{2e}

The main reason for the difference is the number of commissioned biogas units during this monitoring period, which is lower than the estimate within the PDD. Project participants assumed at the point of validation a faster development and commissioning of biogas units which was the basis for ex-ante calculation.

E.6. Remarks on increase in achieved emission reductions

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n/a

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Document information

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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